FIG. 1

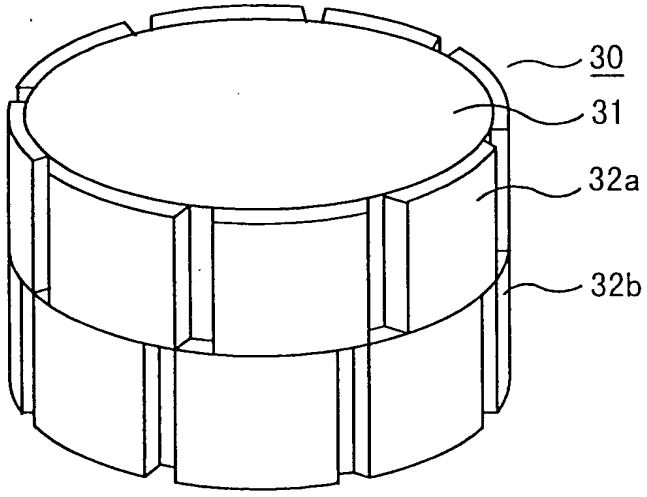

FIG. 2A

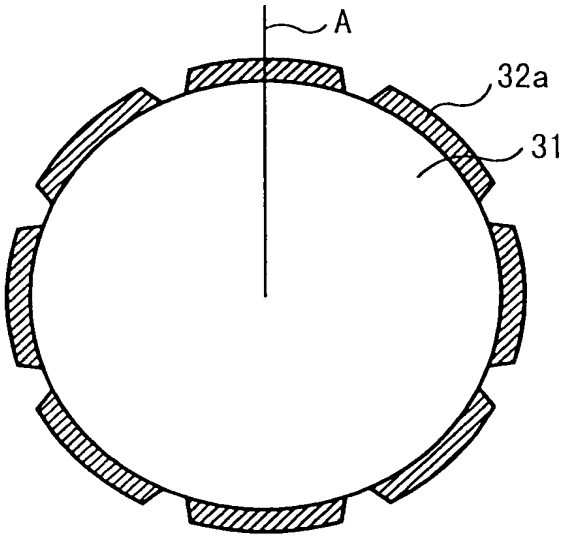

FIG. 2B

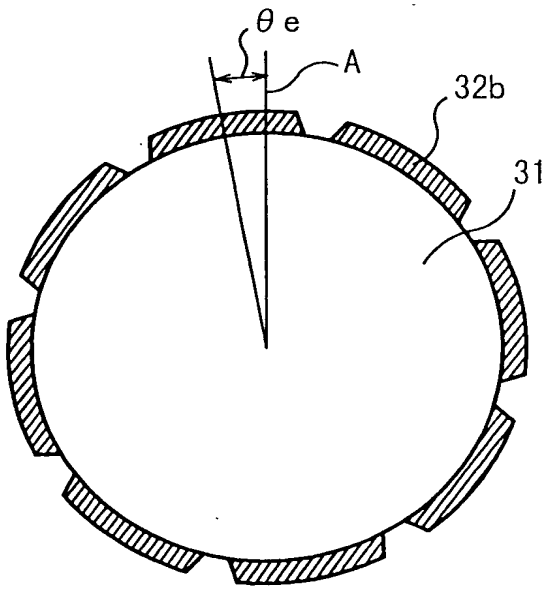

FIG. 3

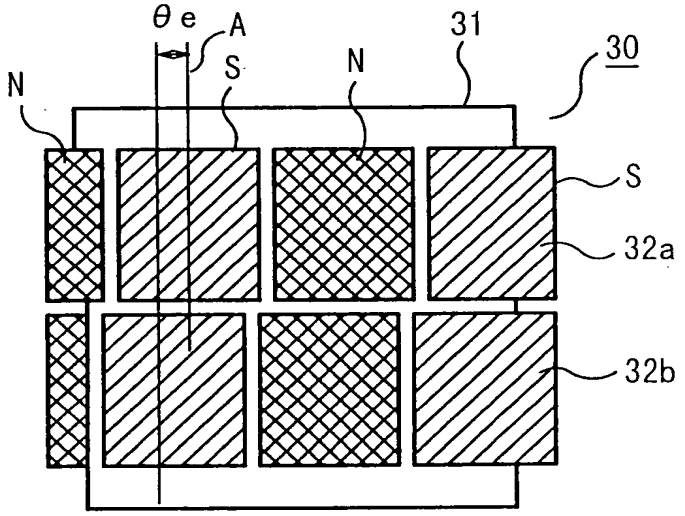

FIG. 4

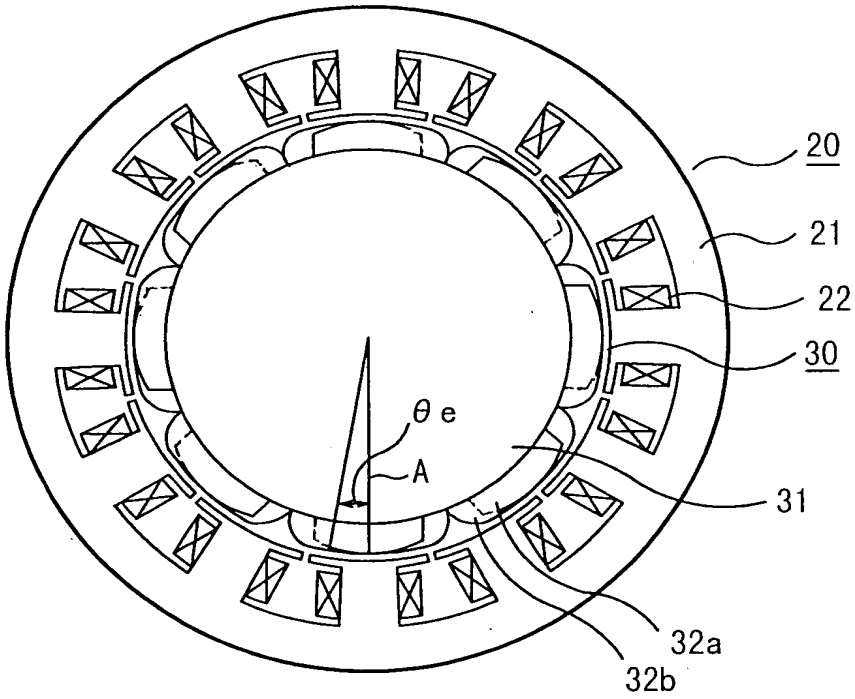

FIG. 5

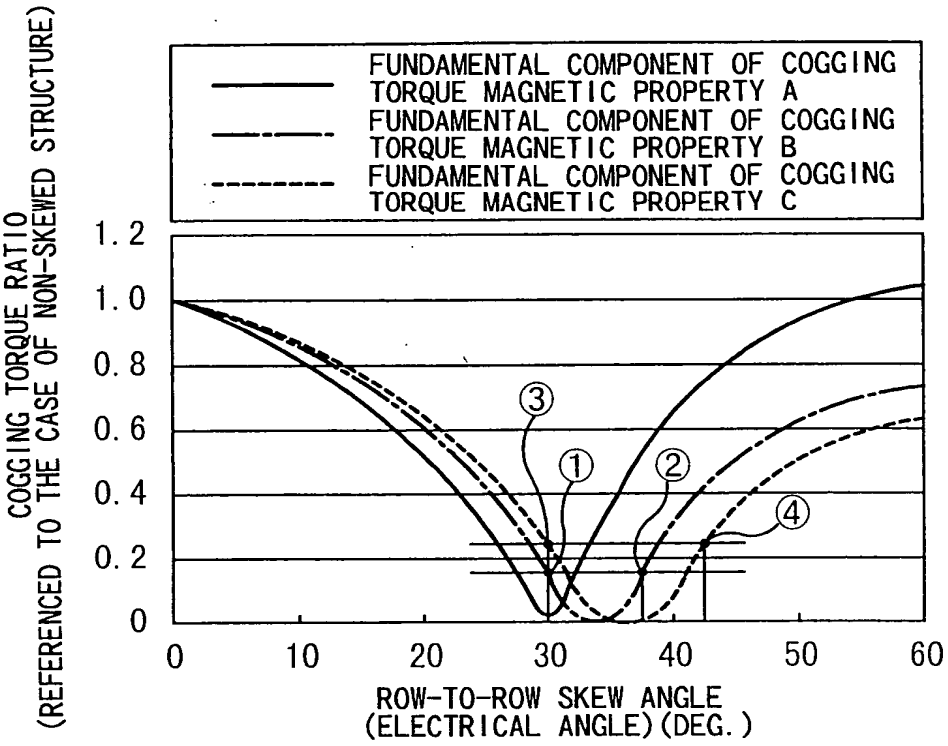
FUNDAMENTAL COMPONENT OF COGGING TORQUE MAGNETIC PROPERTY A
FUNDAMENTAL COMPONENT OF COGGING TORQUE MAGNETIC PROPERTY B
FUNDAMENTAL COMPONENT OF COGGING TORQUE MAGNETIC PROPERTY C
COGGING TORQUE RATIO (REFERENCED TO THE CASE OF NON-SKEWED STRUCTURE)
1.2
1.0
0.8
0.6
0.4
0.2
0
0
10
20
30
40
50
60
③
①
②
④
ROW-TO-ROW SKEW ANGLE (ELECTRICAL ANGLE)(DEG.)

FIG. 6

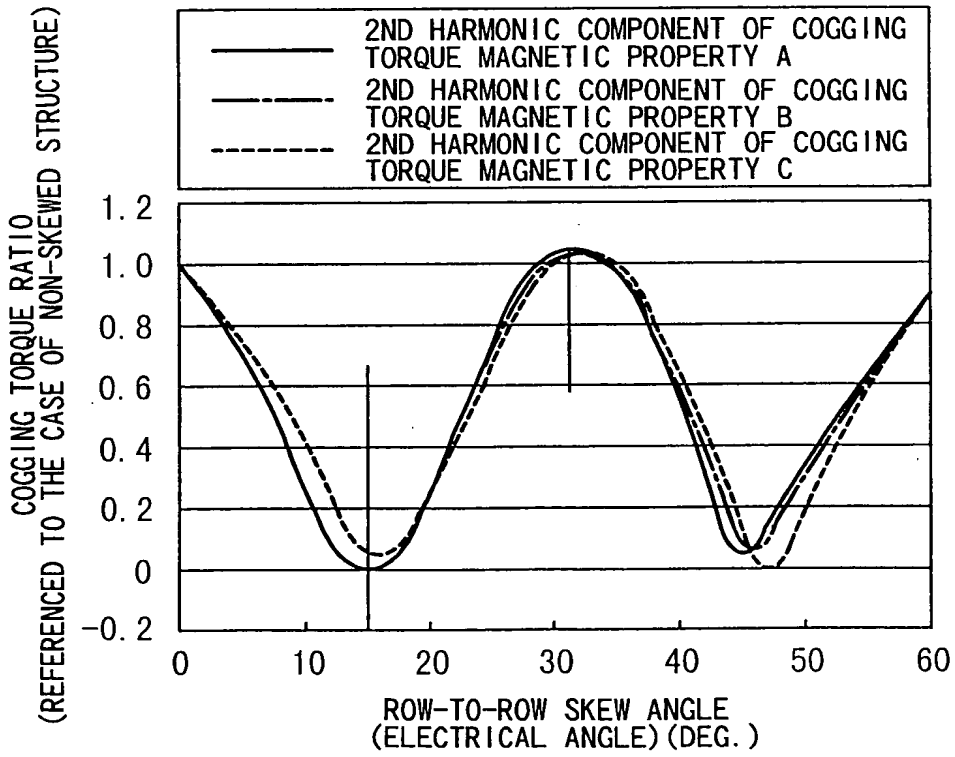
2ND HARMONIC COMPONENT OF COGGING TORQUE MAGNETIC PROPERTY A
2ND HARMONIC COMPONENT OF COGGING TORQUE MAGNETIC PROPERTY B
2ND HARMONIC COMPONENT OF COGGING TORQUE MAGNETIC PROPERTY C
COGGING TORQUE RATIO (REFERENCED TO THE CASE OF NON-SKEWED STRUCTURE)
1.2
1.0
0.8
0.6
0.4
0.2
0
-0.2
0
10
20
30
40
50
60
ROW-TO-ROW SKEW ANGLE (ELECTRICAL ANGLE)(DEG.)

FIG. 7

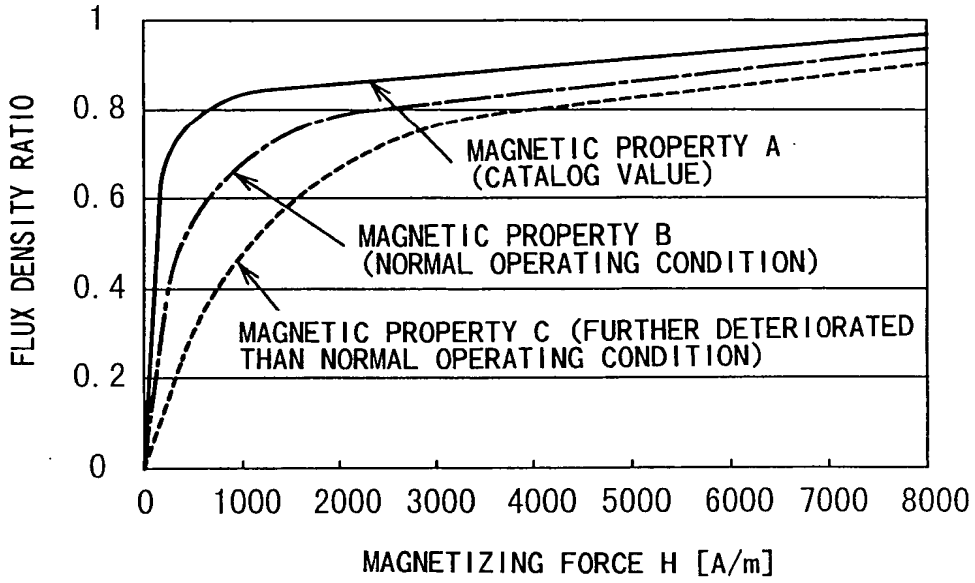
1
0.8
0.6
0.4
0.2
0
FLUX DENSITY RATIO
0
1000
2000
3000
4000
5000
6000
7000
8000
MAGNETIZING FORCE H [A/m]
MAGNETIC PROPERTY A
(CATALOG VALUE)
MAGNETIC PROPERTY B
(NORMAL OPERATING CONDITION)
MAGNETIC PROPERTY C (FURTHER DETERIORATED
THAN NORMAL OPERATING CONDITION)

FIG. 8

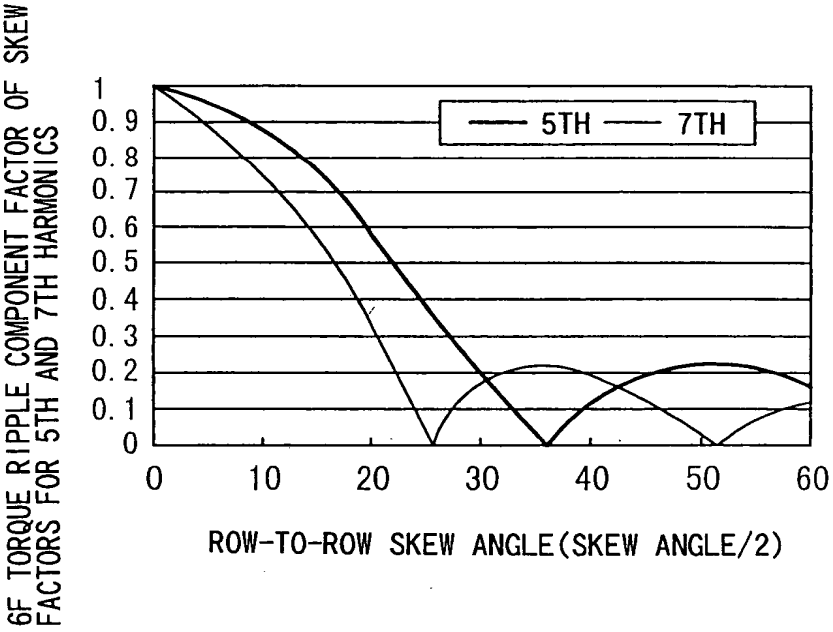
6F TORQUE RIPPLE COMPONENT FACTOR OF SKEW FACTORS FOR 5TH AND 7TH HARMONICS
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
5TH
7TH
0
10
20
30
40
50
60
ROW-TO-ROW SKEW ANGLE(SKEW ANGLE/2)

FIG. 9

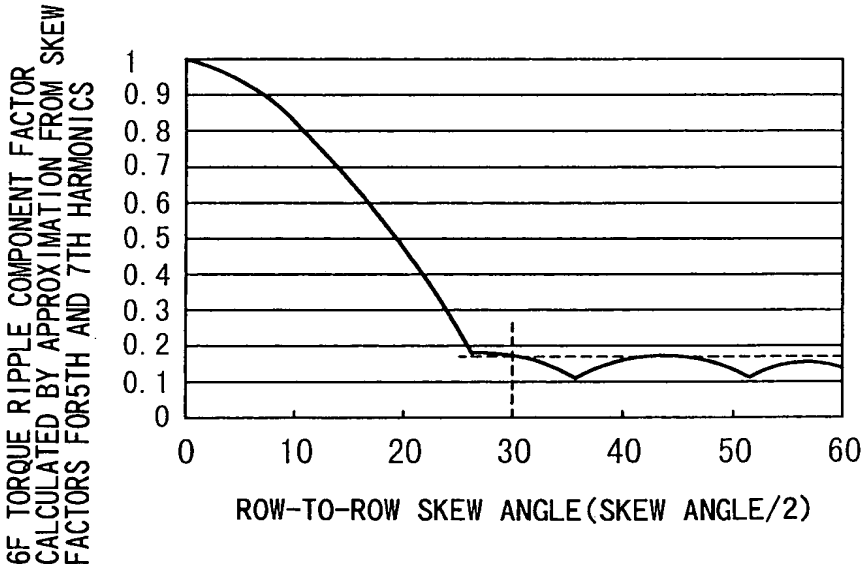
6F TORQUE RIPPLE COMPONENT FACTOR CALCULATED BY APPROXIMATION FROM SKEW FACTORS FOR5TH AND 7TH HARMONICS
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
10
20
30
40
50
60
ROW-TO-ROW SKEW ANGLE(SKEW ANGLE/2)

FIG. 10

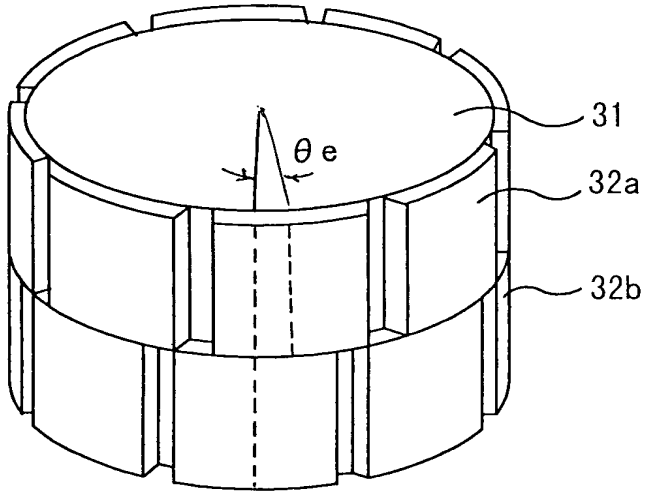
31
θe
32a
32b

FIG. 11

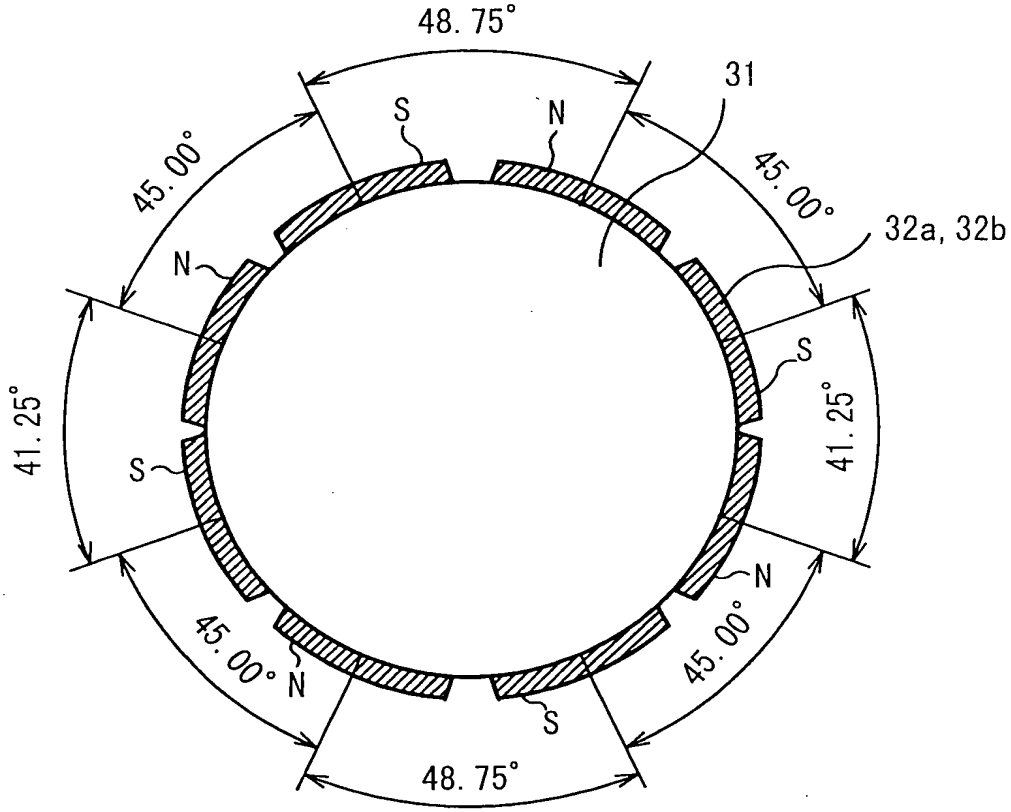
48.75°
31
S
N
45.00°
45.00°
32a, 32b
N
S
41.25°
41.25°
S
N
45.00°
45.00°
N
S
48.75°

FIG. 12

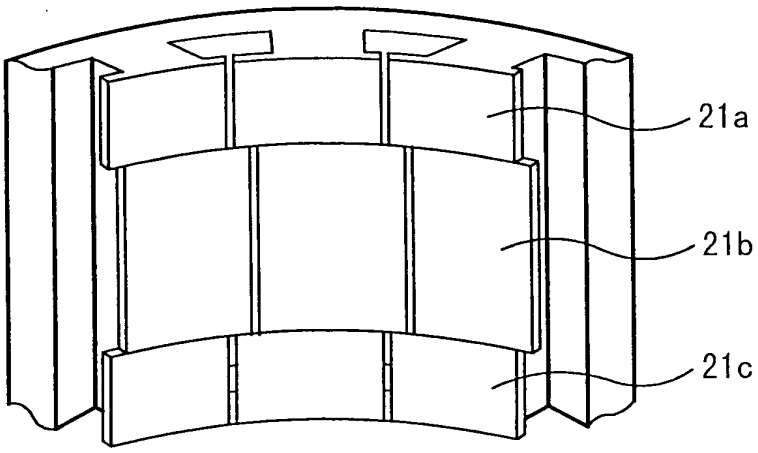

FIG. 13

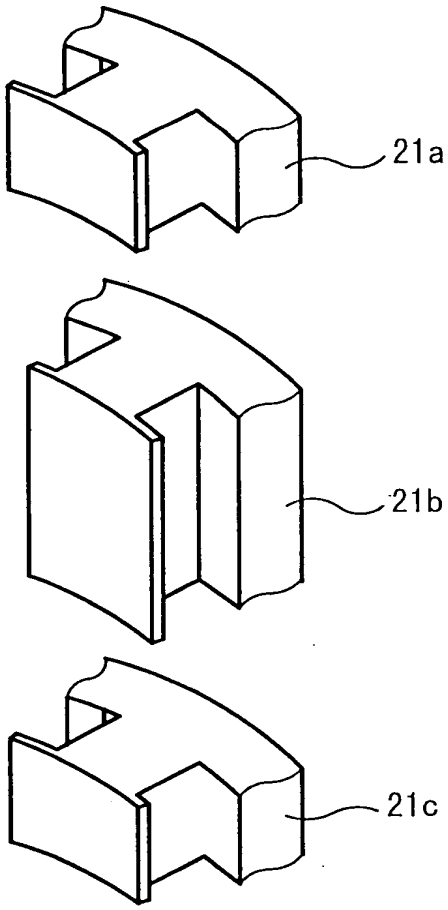

FIG. 14

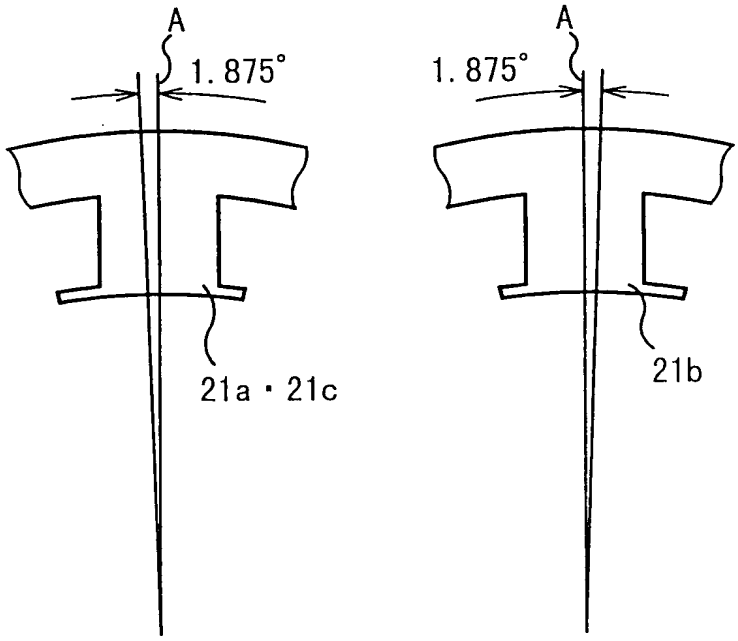

FIG. 15

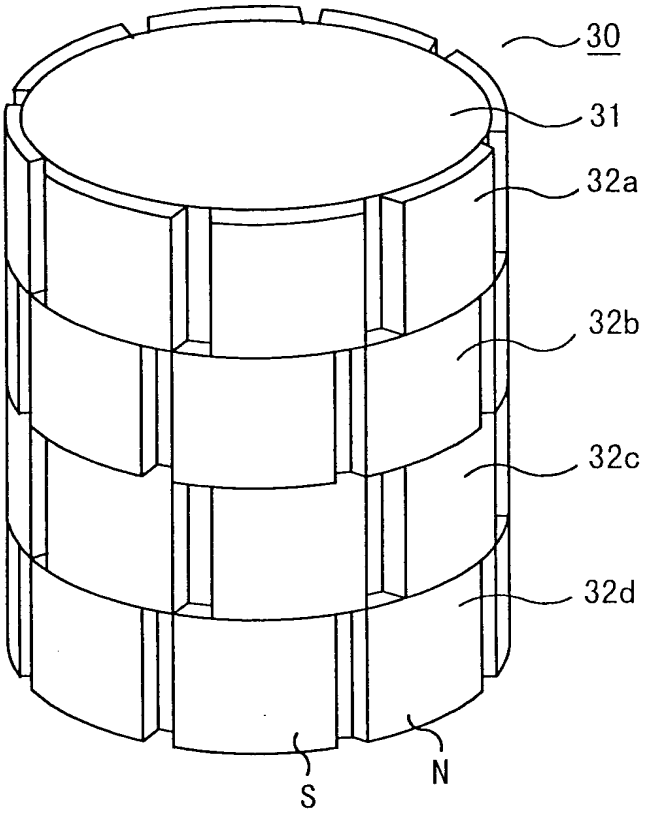

FIG. 16A

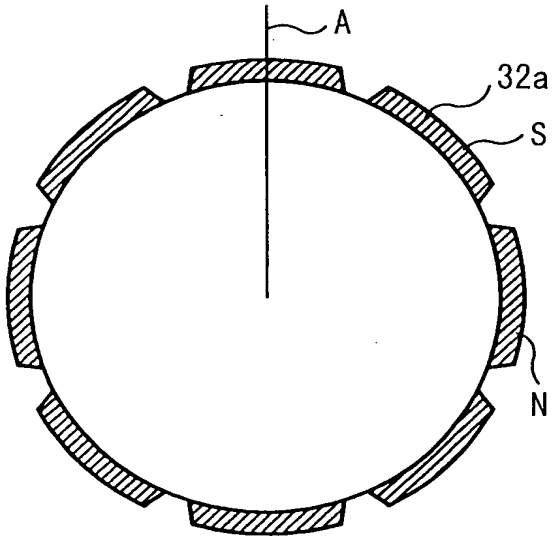

FIG. 16B

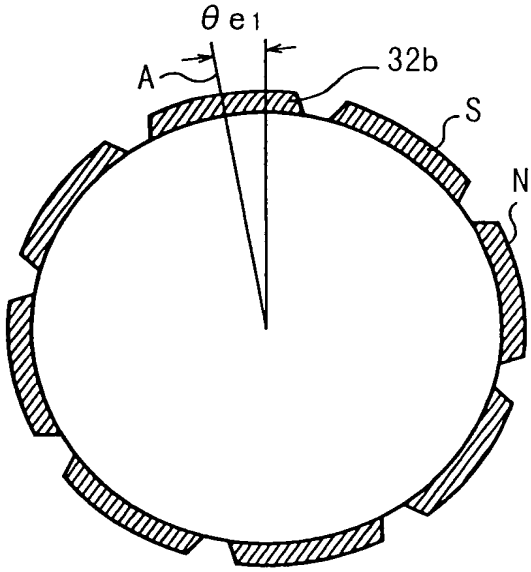

FIG. 16C

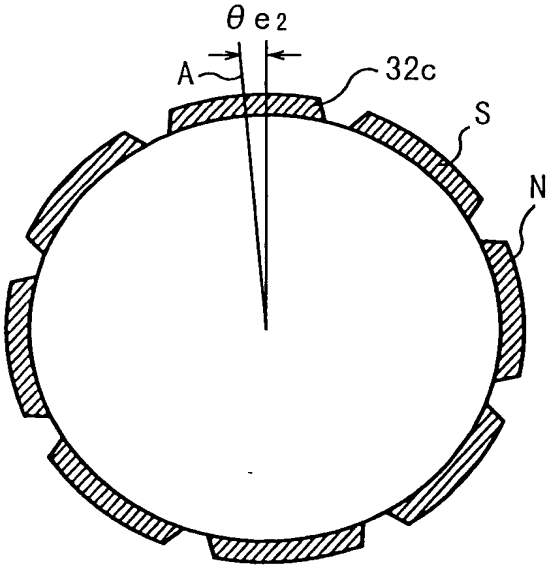

FIG. 16D

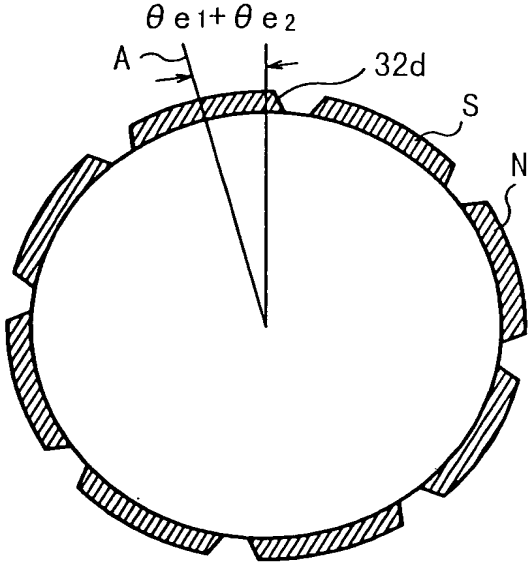

FIG. 17

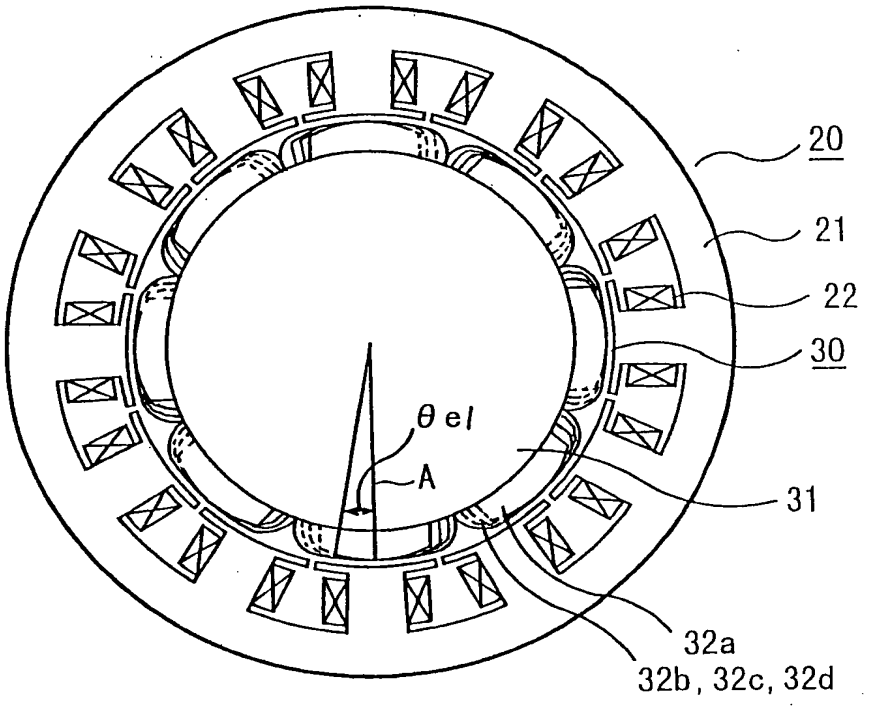

FIG. 18

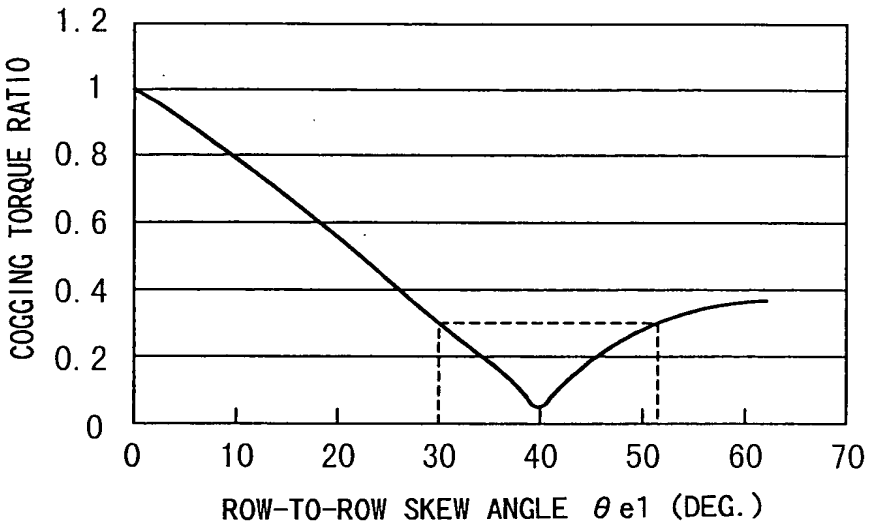
1.2
1
0.8
0.6
0.4
0.2
0
COGGING TORQUE RATIO
0
10
20
30
40
50
60
70
ROW-TO-ROW SKEW ANGLE θe1 (DEG.)

FIG. 19

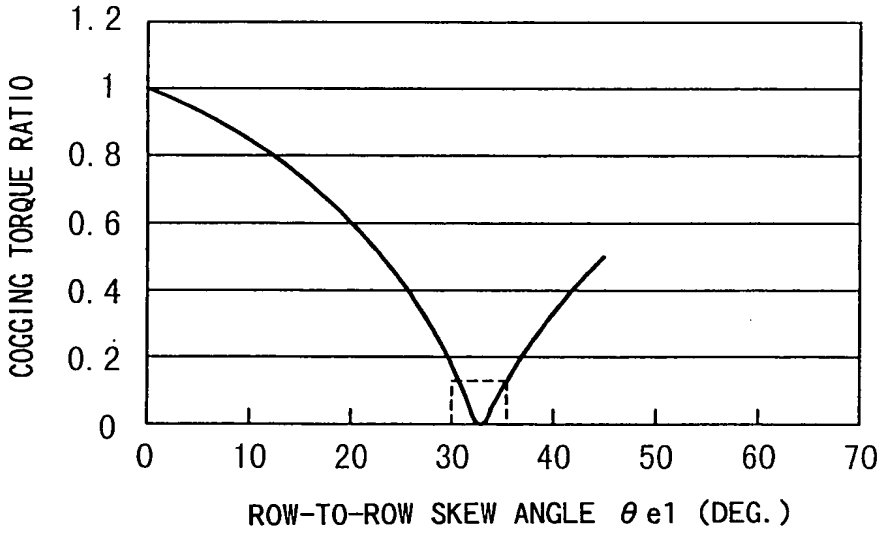
1.2
1
0.8
0.6
0.4
0.2
0
COGGING TORQUE RATIO
0
10
20
30
40
50
60
70
ROW-TO-ROW SKEW ANGLE θe1 (DEG.)

FIG. 20

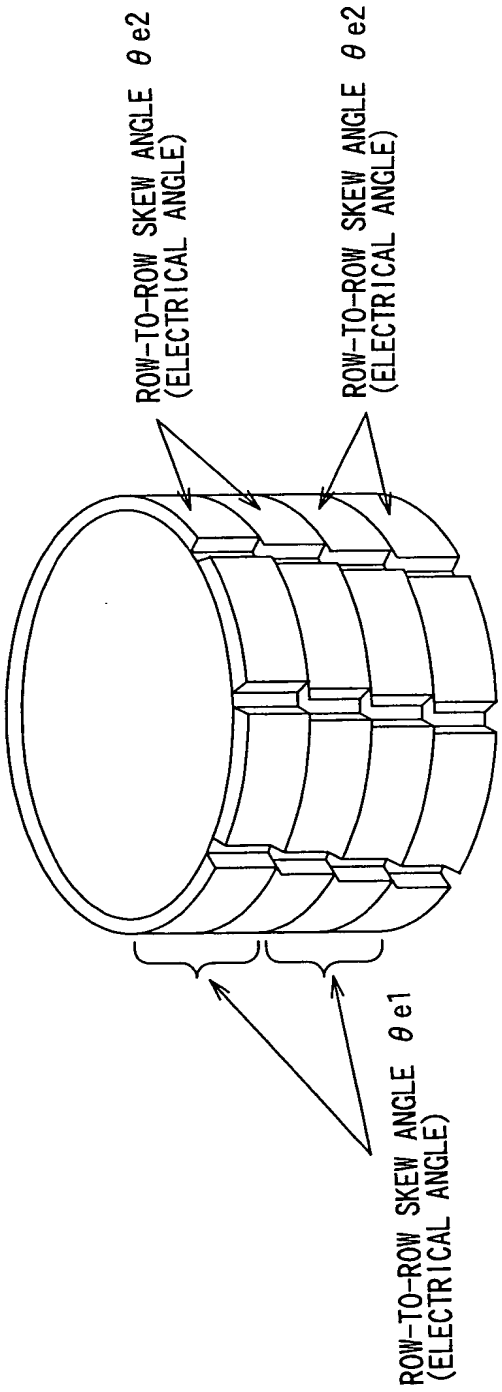
ROW-TO-ROW SKEW ANGLE θe2
(ELECTRICAL ANGLE)
ROW-TO-ROW SKEW ANGLE θe2
(ELECTRICAL ANGLE)
ROW-TO-ROW SKEW ANGLE θe1
(ELECTRICAL ANGLE)

FIG. 21A

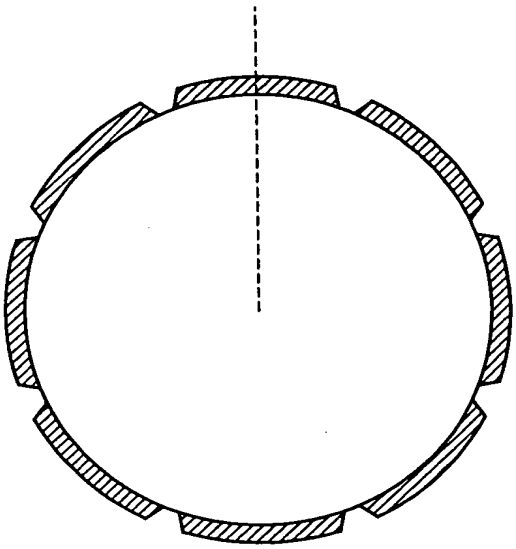

FIG. 21B

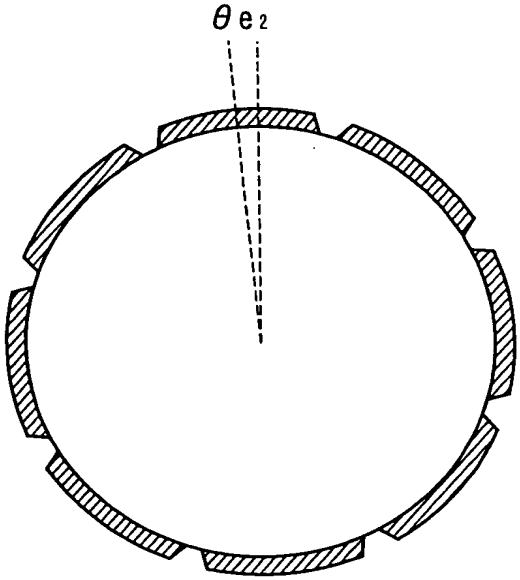

FIG. 21C

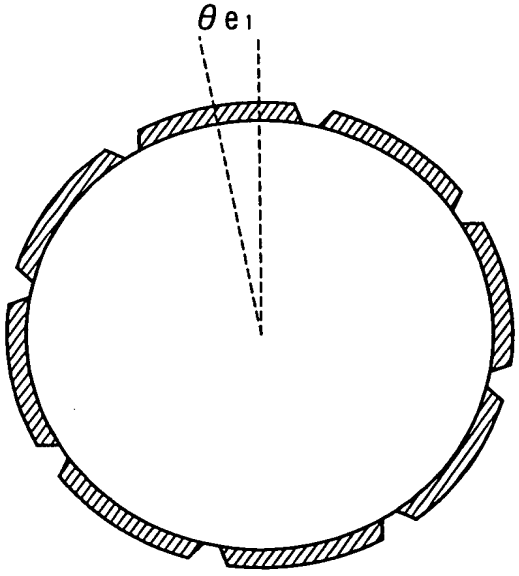
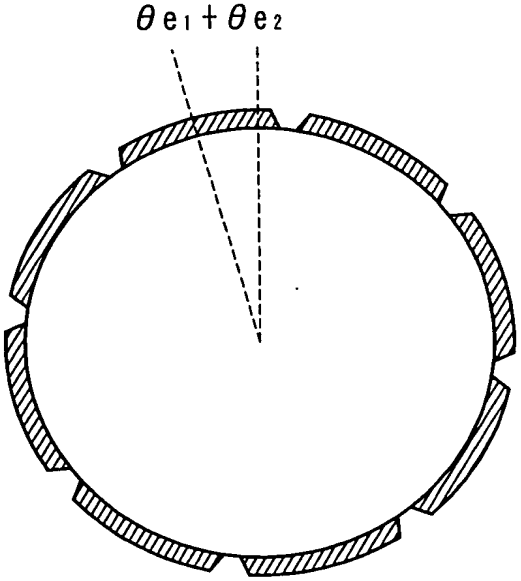
FIG. 21D